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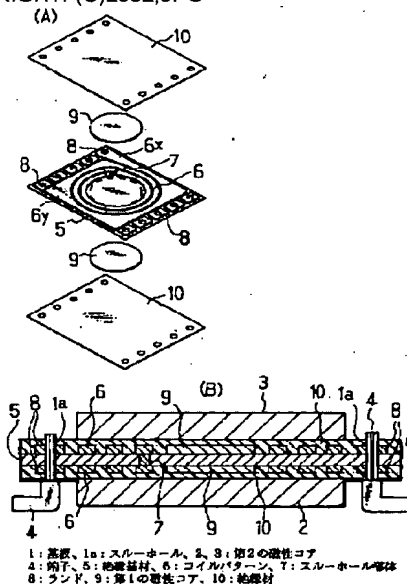
H01F 17/04**H01F 27/06****H01F 37/00**(21) Application number: **2000183212**(71) Applicant: **TDK CORP**(22) Date of filing: **19.06.00**(72) Inventor: **KAWAKUBO NAOKI**(54) **COIL PART**

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a coil part using a print coil pattern, in which the production cost can be reduced by eliminating the need for making of a through-hole for inserting a leg into a core and the problem of heat generation due to gap be reduced enabling reduction in size.

SOLUTION: A print coil pattern 6 of 80-300 μm thickness is formed on the front and on the rear surfaces of an insulation base material 5. First magnetic cores 9, whose thickness is substantially the same or slightly smaller than that of the coil pattern 6, are arranged at the central part on the front and rear surfaces thereof, while the cores are disposed with the insulation base material 5 being pinched. Insulation materials 10 are joined in a manner such that the material 5 having the coil pattern 6 and cores 9 are covered therewith, thereby forming a substrate 1. Second magnetic cores 2 and 3, forming a magnetic path together with the cores 9, are assembled on the substrate 1.

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CLAIMS

[Claim(s)]

[Claim 1] A printed coil pattern is formed in the front rear face of an insulating base material at the thickness of 80-300 micrometers. In the center section of the coil pattern on said rear face of a table, the almost same thickness as the thickness of a coil pattern or the 1st a little thin magnetic core is arranged on both sides of said insulating base material. The coil component characterized by attaching the 2nd magnetic core which covers the insulating base material and the 1st magnetic core which have said coil pattern with an insulating material, constitutes a substrate, and constitutes a magnetic path with said 1st magnetic core to said substrate.

[Claim 2] A printed coil pattern is formed in the front rear face of the insulating base material of two or more sheets at the thickness of 80-300 micrometers, respectively. In the center section of the coil pattern on said rear face of a table, the almost same thickness as the thickness of a coil pattern or the 1st a little thin magnetic core is arranged on both sides of said insulating base material. While carrying out the laminating of two or more coil units which have said coil pattern and the 1st magnetic core through an insulating material The coil component characterized by attaching the 2nd magnetic core which covers the maximum upper layer and the lowest layer with an insulating material, constitutes a substrate, and constitutes a magnetic path with said 1st magnetic core to said substrate.

[Claim 3] A printed coil pattern is formed in the front rear face of the insulating base material of two or more sheets at the thickness of 80-300 micrometers. The 3rd magnetic larger core of thickness than the thickness of the sum total of the coil pattern which counters the insulating base material of two or more sheets which has said coil pattern You make it placed between the center section of the coil pattern, and a laminating is carried out. At the front rear face of this layered product The almost same thickness as the thickness of a coil pattern or the 1st a little thin magnetic core is arranged in the center section of the coil pattern. The coil component characterized by attaching the 2nd magnetic core which furthermore covers the front rear face of a layered product with an insulating material, constitutes a substrate, and constitutes a magnetic path with the said 1st and 3rd magnetic core to said substrate.

[Claim 4] The coil component characterized by enclosing the insulating resin with which between said coil patterns which counter is insulated in the coil component of claim 3.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the transformer and choke coil for flyback circuits which are applied to coil components used for electronic equipment or a power unit, such as a thin transformer and a choke coil, especially need a core gap.

[0002]

[Description of the Prior Art] Also in the transformer for power sources, or the choke coil, a miniaturization and thin shape-ization are demanded with the miniaturization of the latest electronic equipment. A bobbin is not used in order to meet such a demand, but various kinds of transformers and choke coils which constituted the coil with the printed coil have been used.

[0003] The external view of this kind of conventional transformer is shown in drawing 11 (A), and layer structure is shown in drawing 11 (B). This coil

component carries out the laminating of the insulating base material of two or more sheets with which the curled form coil pattern was formed in one side or both sides through an insulating layer, and makes a through hole 21 in the core of the substrate 20 by which the laminating was carried out, and this its substrate 20 is pinched with the I-beam magnetism core 22 and E mold magnetism core 23, and it inserts and attaches the inside foot 24 of E mold core 23 to a through hole 21. 25 is a terminal inserted in the through hole 26 established in the substrate 20.

[0004]

[Problem(s) to be Solved by the Invention] Since a through hole 21 is formed in a multilayer printed board 20 and the inside foot 24 of the magnetic core 23 is fitted in and constituted in the through hole 21 in the above-mentioned conventional coil component, Processing of a through hole 21 is needed. This punching processing Since the size of a through hole 21 is large, two or more pinholes are made in the shape of a said alignment with laser etc. at the periphery of the formation location of a through hole 21, respectively. By the set of the pinhole the process of making a through hole 21 as a whole -- not adopting -- since it did not need to obtain but every one coil component needed to perform the hole processing, the processing man day increased and there was a trouble of causing cost quantity.

[0005] Moreover, in coil components, such as a transformer, by forming a gap between the inside foot 24 of E mold magnetism core 23, and the I-beam core 22, it constitutes so that it may operate in the condition that cores 22 and 23 cannot be saturated easily. However, generally it is known that the leakage flux generated from the part of this gap makes the coil near the gap generate heat. Then, in order to lessen this leakage flux, the coil near the gap is separated from an inside foot, or it is necessary to take the measures of not preparing a coil in a gap periphery, and these things serve as hindrance of a miniaturization of a coil component.

[0006] This invention aims at offering the coil component of a configuration of that cost reduction becomes possible in the coil component using a printed coil pattern in view of the above-mentioned trouble by making unnecessary processing of the through hole for inside foot insertion of a core, and the problem of generation of heat of the coil by said gap is reduced, and it can miniaturize.

[0007]

[Means for Solving the Problem] The coil component of claim 1 forms a printed coil pattern in the front rear face of an insulating base material at the thickness of 80-300 micrometers. In the center section of the coil pattern on said rear face of a table, it is almost the same as the thickness of said coil pattern, or the 1st a little thin magnetic core is arranged on both sides of said insulating base material in it. It is characterized by attaching the 2nd magnetic core which joins so that the insulating base material and the 1st magnetic core which have said coil pattern may be covered with an insulating material, constitutes a substrate, and constitutes a magnetic path with said 1st magnetic core to said substrate.

[0008] The coil component of claim 2 forms a printed coil pattern in the front rear face of the insulating base material of two or more sheets at the thickness of 80-300 micrometers, respectively. In the center section of the coil pattern on said rear face of a table, the almost same thickness as the thickness of a coil pattern or the 1st a little thin magnetic core is arranged on both sides of said insulating base material. While carrying out the laminating of two or more coil units which have said coil pattern and the 1st magnetic core through an insulating material, it is characterized by attaching the 2nd magnetic core which covers the maximum upper layer and the lowest layer with an insulating material, constitutes a substrate, and constitutes a magnetic path with said 1st magnetic core to said substrate.

[0009] Processing of the through hole for inside foot insertion of a magnetic core becomes unnecessary by making a magnetic core build like claims 1 and 2 in some

substrates which become by the layered product. Since the 1st magnetic core can be constituted as a part of layered product, the laminating of many 1st magnetic core can be carried out to coincidence by picking.

[0010]Moreover, since the 1st magnetic core is arranged inside the substrate which becomes by the layered product, the gap between the 2nd magnetic core is distributed and generation of heat of the coil by leakage flux also decreases sharply. For this reason, a core is made large-sized, magnetic flux is reduced, or it becomes unnecessary to prepare space between a gap and a coil, and a miniaturization becomes possible.

[0011]The coil component of claim 3 forms a printed coil pattern in the front rear face of the insulating base material of two or more sheets at the thickness of 80-300 micrometers. The 3rd magnetic larger core of thickness than the thickness of the sum total of the coil pattern which counters the insulating base material of two or more sheets which has said coil pattern. You make it placed between the center section of the coil pattern, and a laminating is carried out. At the front rear face of this layered product. The almost same thickness as the thickness of a coil pattern or the 1st a little thin magnetic core is arranged in the center section of the coil pattern. It is characterized by attaching the 2nd magnetic core which furthermore covers the front rear face of a layered product with an insulating material, constitutes a substrate, and constitutes a magnetic path with the said 1st and 3rd magnetic core to said substrate.

[0012]Thus, when pinching the total thickness halfbeak's of the coil pattern which counters 3rd thick magnetic core, the insulating material between coil units becomes unnecessary, and the 3rd magnetic core between coil units lives in the core of a coil pattern by one. Moreover, the thickness of the 3rd magnetic core can adjust spacing of a coil pattern. However, the insulating material between the coil patterns which counter is needed.

[0013]The coil component of claim 4 is characterized by enclosing the insulating resin with which between said coil patterns which counter is insulated in the coil component of claim 3.

[0014]Thus, as compared with the case where an insulating material is applied on the structure which encloses resin between the coil patterns which counter, then a coil pattern, insulating processing is easy and it is ****.

[0015]

[Embodiment of the Invention]The perspective view and drawing 1 (B) which show the choke coil (inductor) whose drawing 1 (A) is the gestalt of 1 operation of the coil component of this invention are [the layer structure Fig. of that substrate and drawing 2 (B) of that decomposition perspective view and drawing 2 (A)] the sectional views of this coil component.

[0016]In drawing 1 (A) and (B), the substrate of a laminated structure, the I-beam magnetism core which attaches 1 to two and attaches three to a substrate 1 from an outside, respectively and C mold magnetism core, and 4 are terminals inserted and fixed to through hole 1a prepared in the substrate 1. In drawing 2 (A) and (B), the insulating base material which 5 becomes by resin etc., and 6 are the curled form coil patterns formed in the front rear face of this insulating base material 5, respectively, and these coil patterns 6 and 6 are connected by the conductor 7 prepared in the through hole of the insulating base material 5 at the inner circumference side. The drawer sections 6x and 6y of the coil patterns 6 and 6 on the rear face of front are connected to the thing of the location where two or more lands 8 which form the through hole for terminal insertion formed in the edge on the rear face of front differ at one, respectively.

[0017]9 is 1st magnetic core arranged in the center section of the coil patterns 6 and 6 in the front rear face of the insulating base material 5. this -- or [that the thickness of the 1st magnetic core 9 is almost the same as the thickness of the coil pattern 6] -- or it is formed a little thinly. 10 is an insulating material arranged and joined to the front rear face of the insulating base material 5, as the coil pattern 6 and the 1st magnetic core 9 are covered. This

insulating material 10 can use the insulating prepreg which can be joined to the insulating base material 5 side by heating sticking by pressure. Moreover, the insulating material which forms an insulating layer by spreading on the insulating base material 5 which formed sheet-like not a thing but a coil pattern, and the 1st magnetic core 9 may be used as this insulating material 10.

[0018]The element equivalent to parts for many coil component is formed on the same side at coincidence until a laminating process ends the insulating base material 5 of this coil component and the coil pattern 6, the 1st magnetic core 9, and an insulating material 10. Like a publication said coil pattern 6 to JP,11-204361,AA substrate thin film layer and the resist on it are formed on the insulating base material 5 which becomes with a glass epoxy resin, a ceramic, etc. On a part for the slot which removed the resist in the shape of [of a small slot] a coil pattern, and removed the resist, and its near sectionIt is effective to use how the cross-section configuration expanded from the flute width forms a mushroom-like coil pattern in the semantics which sets up radial spacing of the coil pattern 6 with a sufficient precision, narrows, and enlarges the cross section of the coil pattern 6, and enlarges current capacity.

[0019]Moreover, the metal thing which covered the 1st magnetic core 9 with ferrite mold goods or an insulator layer is used. These 1st magnetic core 9 is set to the set sections, such as a crevice, in all directions on the surface of the fixture, adhesives can be applied to the front face, and the approach of making the center section of the coil pattern 6 counter on it, and joining can be used. Moreover, it can arrange in the center section of the coil pattern 6 by arranging the 1st magnetic core 9 in the fixed pitch in every direction to the insulating material 10, making the field by the side of the 1st magnetic core 9 counter each center section of the forming face of the coil pattern 6, and joining.

[0020]In addition, as for the thickness of the insulating base material 5, 200 micrometers is adopted as an example, as for the thickness of 60 micrometers and the coil pattern 6. As for the thickness of 10 micrometers - 200 micrometers and the coil pattern 6, in the semantics which constitutes a coil component in a thin shape, and secures current capacity, it is [the thickness of the insulating base material 5] desirable to be referred to as 80 micrometers - 300 micrometers. Moreover, in this example, the thickness of the 1st magnetic core 9 was set as 200 micrometers as well as the thickness of the coil pattern 6. or [that the thickness of this 1st magnetic core 9 is almost the same as the thickness of the coil pattern 6] -- or what is necessary is just to set up a little thinly

[0021]The I-beam magnetism core 2 and C mold magnetism core 3 (these are called the magnetic core of the following 2nd) are attached to the substrate 1 constituted as mentioned above, and it fixes to it on adhesives or a tape.

[0022]Thus, the structure of forming the 1st magnetic core 9 in the interior of a substrate 1 then the 1st magnetic core 9 and the 2nd magnetic core 2, and the gap between three can be formed with an insulating material 10, and it is not necessary to prepare the through hole for core insertion in a substrate 1. For this reason, a man day is reduced. Moreover, since each gap can be made small, generation of heat of the coil pattern 6 by magnetic leakage flux can be reduced, since a gap is formed between the 2nd magnetic core 2 and 3 and the 1st magnetic core 9, respectively and distributed formation of the gap is carried out, and contiguity arrangement of the coil pattern 6 can be carried out at the 1st magnetic core 9, a miniaturization can be attained.

[0023]Drawing 3 is the layer structure Fig. showing the gestalt of other operations of the coil component of this invention. what the gestalt of this operation consists of as a thin transformer -- it is -- the front rear face of insulating base material 5A -- an inner circumference side -- a through hole -- with the coil unit in which coil pattern 6A connected by the conductor was

formedThe coil unit in which coil pattern 6B was formed at the front rear face of insulating base material 5B (although the terminal 4 which the both ends of coil pattern 6B on the rear face of front of this example are connected to the land 8 on the rear face of front, and penetrates a land 8 connects with juxtaposition in common)said through hole -- it is good also as structure connected to a serial by the conductor 7. the front rear face of insulating base material 5C -- an inner circumference side -- a through hole -- the coil unit in which coil pattern 6C connected by the conductor 7 was formedArrange the 1st magnetic core 9 in the center of each coil pattern 6A-6C, and an insulating material 10 is made to intervene between each coil unit, further, the laminating of the front rear face of the coil unit of two or more of these sheets is covered and carried out with an insulating material 10, it fixes to one, and a substrate is constituted. The 2nd magnetic core 2 and 3 which forms a magnetic path with said 1st magnetic core 9 is attached to this substrate.

[0024]In this configuration, others are used as a secondary winding, using either of the coil patterns 6A-6C as a primary winding. Thus, in this invention, the laminating number of sheets of a coil unit is set up according to an application.

[0025]The layer structure Fig. and drawing 5 which show the gestalt of other operations of the coil component according [drawing 4] to this invention are the sectional view. The inside 5A-5C of drawing is the insulating base material which formed the coil patterns 6A-6C to which the front rear face of each other is connected as mentioned above. 11 is 3rd magnetic core which it arranges [3rd] in the center section of the coil patterns 6A-6C, and makes it intervene between each coil unit.

[0026]Said 3rd magnetic core 11 is set as the coil patterns 6A and 6B which counter, or larger thickness than the thickness of the sum total of 6B and 6C. As an example, thickness of the coil patterns 6A-6C was set to 200 micrometers, and thickness of the 3rd magnetic core 11 was set to 460 micrometers. Therefore, when the laminating of these coil units is carried out, spacing of about 60 micrometers is formed between coil pattern 6A and 6B or between 6B and 6C.

[0027]The 1st magnetic core 9 is arranged, respectively in the center of a top face of insulating base material 5A of the maximum upper layer, and the center of an inferior surface of tongue of insulating base material 5C of the lowest layer. In this example, thickness of the 1st magnetic core 9 was set to 200 micrometers as well as the thickness of the coil patterns 6A and 6C. The top face of coil pattern 6A of these maximum upper layer and the 1st magnetic core 9 and the inferior surface of tongue of coil pattern 6C of the lowest layer are covered by the insulating material 10, respectively. Between each coil unit, before cutting a layered product for each chip, between coil pattern 6A, 6B and 6B, and 6C which counter is insulated by enclosing and stiffening the resin 12 of the letter of a flow by the vacua. And a substrate is constituted by unifying these coil units with the 1st magnetic core 9 and the up-and-down insulating material 10.

[0028]Thus, a magnetic path is constituted with the 2nd magnetic core 2 and 3, said 1st magnetic core 9, and the 3rd magnetic core 11 by attaching the 2nd magnetic core 2 and 3 of the above mentioned structure to the constituted substrate.

[0029]Thus, by pinching the 3rd thick magnetic core 11, the insulating material between coil units becomes unnecessary, and the number of the 3rd magnetic core 11 between coil units is one, it ends, and components mark also reduce the coil patterns 6A and 6B which counter the core of a coil pattern, or the total thickness halfbeak of 6B and 6C. Moreover, the resin 12 enclosed can perform the insulation between the coil patterns which counter easily. Moreover, the thickness of the 3rd magnetic core can adjust spacing of a coil pattern.

[0030]The perspective view showing the choke coil whose drawing 6 (A) is the gestalt of other operations of the coil component of this invention, and (B) are

[the layer structure Fig. and drawing 8 of the decomposition perspective view and drawing 7] the sectional view. The gestalt of this operation arranges the 4th magnetic core 13 which loses pleuropodium 3a of the 2nd magnetic core 3 shown in drawing 1, instead is built in substrate 1A to the periphery side of the coil pattern 6 in the front rear face on the insulating base material 5. In drawing 6 - drawing 8, the same sign as drawing 1 and drawing 2 shows the components which demonstrate the same function.

[0031]A gap is not only formed among the 1st magnetic core 10 and the 2nd magnetic core 2 and 3A in the center section of the coil component, but in the gestalt of this operation, a gap is formed also in a lateral portion between the 2nd magnetic core 2 and 3A and the 4th magnetic core 13.

[0032]Drawing 9 is the layer structure Fig. showing the example applied to the structure which the insulating material 10 was made to intervene between coil units, and carried out the laminating of the structure of having the 4th magnetic core 13 as shown in drawing 3.

[0033]Drawing 10 is the layer structure Fig. showing the example applied to the structure which the 3rd magnetic core 11 was made to intervene between coil units, and carried out the laminating of the structure of having the 4th magnetic core 13 as shown in drawing 4 and drawing 5.

[0034]
[Effect of the Invention]Since the 2nd magnetic core magnetism core was made to build in some substrates which become by the layered product according to claims 1 and 2, processing of the through hole for inside foot insertion of a magnetic core becomes unnecessary. For this reason, man day reduction is attained and contributes to cost reduction.

[0035]Moreover, since the 1st magnetic core is arranged inside the substrate which becomes by the layered product, the gap between the 2nd magnetic core is distributed and generation of heat of the coil by leakage flux also decreases sharply. For this reason, a core is made large-sized, magnetic flux is reduced, or it becomes unnecessary to prepare space between a gap and a coil, and a miniaturization becomes possible.

[0036]According to claim 3, between coil units, since the total thickness halfbeak of the coil pattern which counters was also made into the structure whose 3rd thick magnetic core is pinched, the insulating material between coil units can become unnecessary, and the number of the 3rd magnetic core between coil units is one, it ends, and, in addition to said effectiveness, reduction of components mark can be aimed at further.

[0037]Since it considered as the structure which encloses resin in claim 3 between the coil patterns which counter according to claim 4, as compared with the case where an insulating material is applied on a coil pattern, insulating processing becomes easy.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The perspective view showing the choke coil (inductor) whose (A) is the gestalt of 1 operation of the coil component of this invention, and (B) are the decomposition perspective view.

[Drawing 2](A) is the layer structure Fig. of the substrate of the coil component of drawing 1, and (B) is the sectional view of this coil component. .

[Drawing 3]It is the layer structure Fig. showing the transformer which is the gestalt of other operations of the coil component of this invention.

[Drawing 4]It is the layer structure Fig. showing the transformer which is the gestalt of other operations of the coil component of this invention.

[Drawing 5]It is the sectional view of the transformer of drawing 4.

[Drawing 6]The perspective view showing the choke coil (inductor) whose (A) is

the gestalt of other operations of the coil component of this invention, and (B) are the decomposition perspective view.

[Drawing 7] It is the layer structure Fig. showing the transformer which is the gestalt of other operations of the coil component of this invention.

[Drawing 8] It is the sectional view of the transformer of drawing 7.

[Drawing 9] It is the layer structure Fig. showing the transformer which is the gestalt of other operations of the coil component of this invention.

[Drawing 10] It is the layer structure Fig. showing the transformer which is the gestalt of other operations of the coil component of this invention.

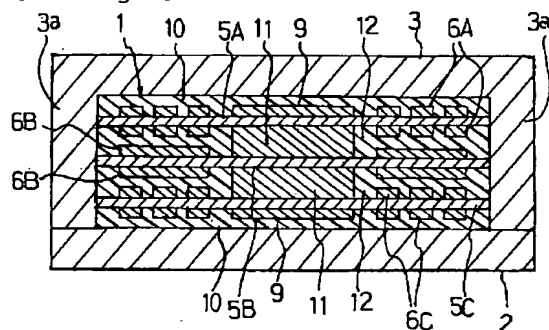
[Drawing 11] The perspective view in which (A) shows the conventional coil component, and (B) are the decomposition perspective view.

[Description of Notations]

1, a 1A: substrate, a 1a: through hole, 2 and 3, and 3A: -- the 2nd magnetic core, 4: terminal, 5, 5A - a 5C: insulation base material, 6, 6A - a 6C: coil pattern, and 7: through hole -- a conductor, 8: land, and 9: -- the 1st magnetic core, 10: insulating material, and 11: -- the 3rd magnetic core, 12: enclosure resin, and 13: -- the 4th magnetic core

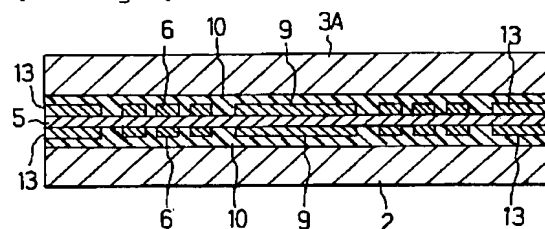
DRAWINGS

[Drawing 5]



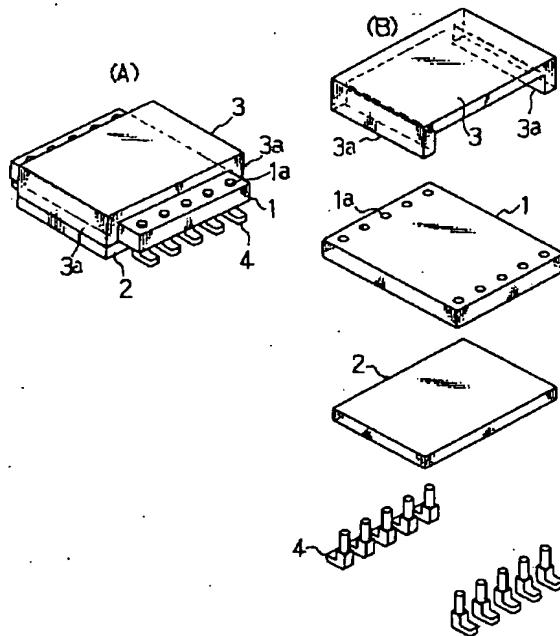
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6A~6C: コイルパターン、9: 第1の磁性コア、10: 絶縁材
11: 第3の磁性コア、12: 封入樹脂

[Drawing 8]



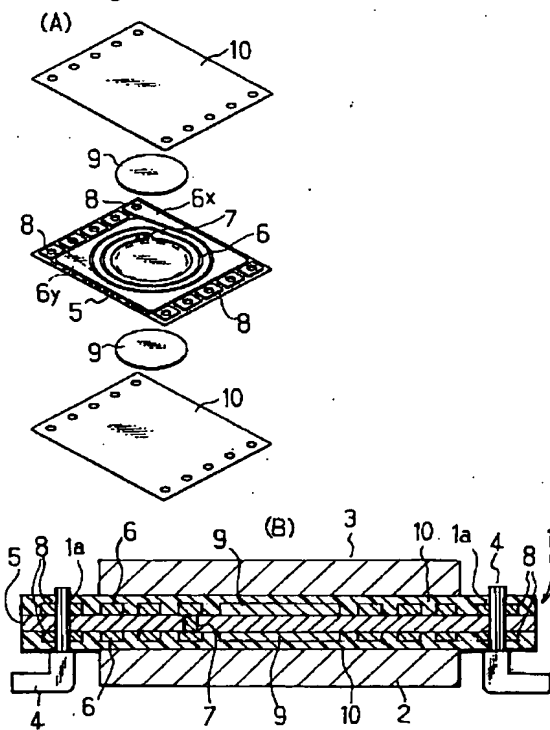
2、3A: 第2の磁性コア、5: 絶縁基材、6: コイルパターン
9: 第1の磁性コア、10: 絶縁材、13: 第4の磁性コア

[Drawing 1]



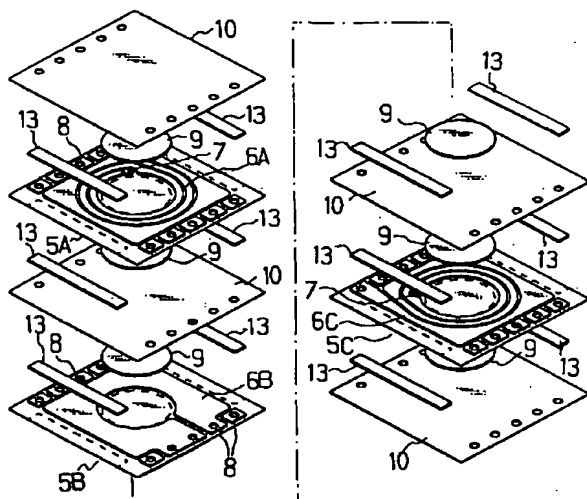
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[Drawing 2]



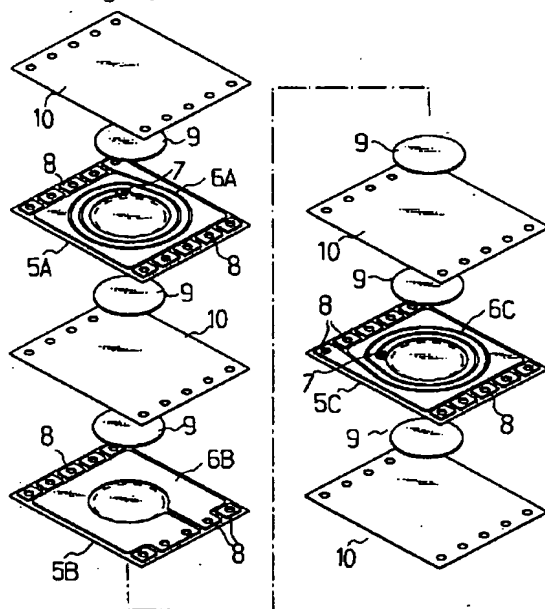
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4: 端子、5: 絶縁基材、6: コイルパターン、7: スルーホール導体
8: ランド、9: 第1の磁性コア、10: 絶縁材

[Drawing 9]



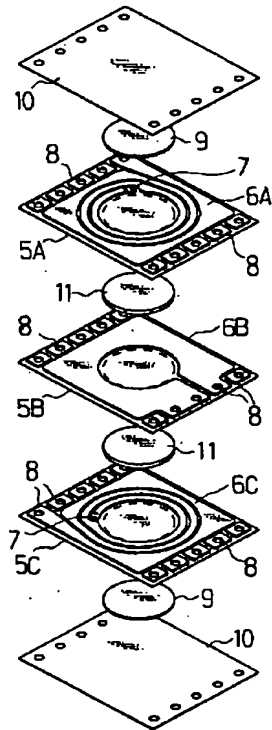
5A~5C: 絶縁基材、6A~6C: コイルパターン、7: スルーホール導体
8: ランド、9: 第1の磁性コア、10: 絶縁材、13: 第4の磁性コア

[Drawing 3]



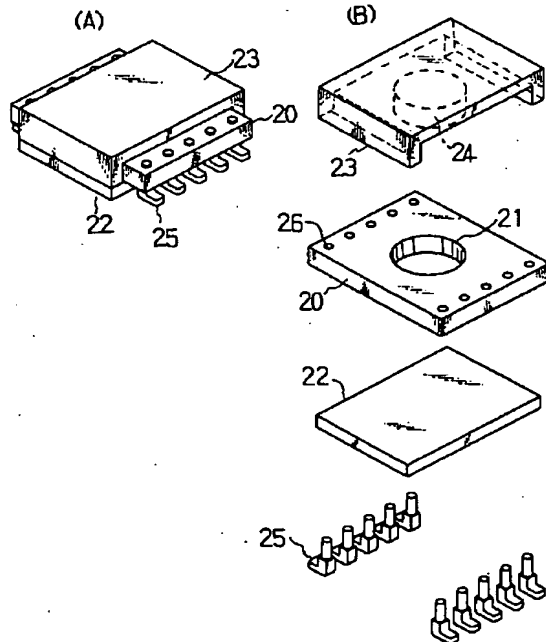
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[Drawing 4]

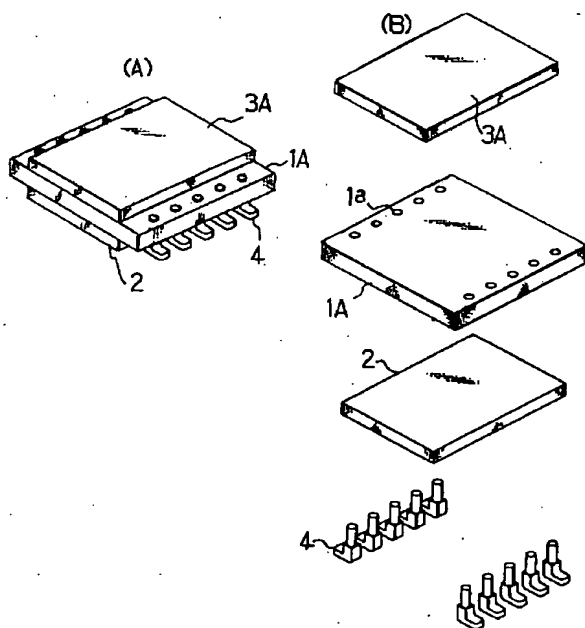


5A~5C: 絶縁基材、6A~6C: コイルパターン、7: スルーホール導体
8: ランド、9: 第1の磁性コア、10: 絶縁材、11: 第3の磁性コア

[Drawing 11]

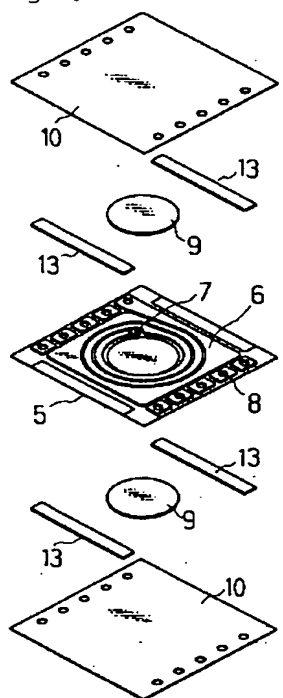


[Drawing 6]



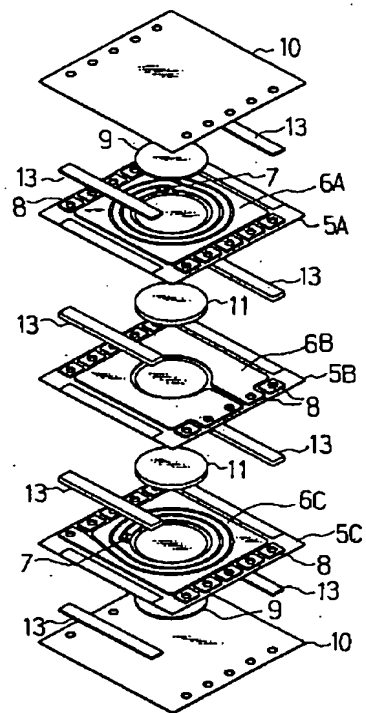
1A: 基板、1a: スルーホール、2、3A: 第2の磁性コア、4: 端子

[Drawing 7]



5: 絶縁基材、6: コイルパターン、7: スルーホール導体、8: ランド
9: 第1の磁性コア、10: 絶縁材、13: 第4の磁性コア

[Drawing 10]



5A～5C：絶縁基材、6A～6C：コイルパターン、7：スルーホール導体
 8：ランド、9：第1の磁性コア、10：絶縁材、11：第3の磁性コア
 13：第4の磁性コア

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